In the Claims

1. (Currently Amended) A solenoid comprising:

a solenoid housing;

a magnetically conductive shell disposed within the solenoid housing and having a single coil of wound wire;

a movable magnetic object disposed within a bore of the single coil, the object configured to receive a magnetic force when current is induced in the single coil;

a permanent magnet disposed within the solenoid housing and having a fixed polarity that magnetically repels the moveable magnetic object when current is induced in the single coil and magnetically attracts an end of the movable magnetic object when no current is induced in the single coil; ~~and~~

a non-magnetic spacer disposed within the solenoid housing and disposed between the permanent magnet and the movable magnetic object; and

a return spring operationally connected to bias the movable magnetic object in a return position against the spacer when no current is induced in the single coil and the return spring at least partially disposed outside the solenoid housing.

2. (Original) The solenoid of claim 1 wherein the moveable magnetic object includes one of a plunger or an armature.

3. (Canceled)

4. (Canceled)

5. (Currently Amended) The solenoid of claim ~~4~~ 1 further comprising an end plate connected to an end opposite to that of the return spring and an attracting stud connected to the end plate, the attracting stud having a polarity opposite to that of the movable magnetic object when current is induced with a specific electrical polarity in the single coil.

6. (Currently Amended) The solenoid of claim 5 further comprising ~~a housing having the single coil, the plunger, the spacer, and~~ a bobbin disposed ~~therein~~within the housing.

7. (Original) The solenoid of claim 6 wherein the single coil is wrapped around the bobbin.

8. (Original) The solenoid of claim 7 further comprising a number of shunt components connected to the bobbin.

9. (Currently Amended) The solenoid of claim 8 wherein the number of shunt components is configured such that as a distance of the shunt components from the permanent magnet increases a hold force between the plunger and permanent magnet decreases.

10. (Original) The solenoid of claim 8 further comprising an air gap between the number of shunt components and the housing.

11. (Currently Amended) An electromagnetic switching apparatus comprising:

a bobbin having a single coil of wire wrapped therearound;

a movable armature disposed within the single coil; and

a permanent magnetic separated from the armature by a non-magnetic spacer wherein the permanent magnet magnetically attracts the armature when the single coil is de-energized and magnetically repels the armature when the single coil is energized, wherein the non-magnetic spacer remains in a fixed position during movement of the movable armature.

12. (Original) The apparatus of claim 11 further comprising an end plate and attracting stud connected to one end of the bobbin wherein the attracting stud attracts the armature when the single coil is energized.

13. (Original) The apparatus of claim 12 further comprising a return spring configured to bias the armature against the spacer when the single coil is de-energized.

14. (Original) The apparatus of claim 13 wherein the armature is further configured to have a first polarity when the single coil is de-energized and a second polarity when the single coil is energized.

15. (Original) The apparatus of claim 14 wherein the second polarity matches a plurality of the permanent magnet.

16. (Original) The apparatus of claim 14 wherein the second polarity is opposite to a polarity of the end plate.

17. (Original) The apparatus of claim 11 further comprising a plurality of shunt components disposed radially around the actuator between the single coil and the permanent magnet.

18. (Withdrawn) A method of manufacturing a single coil solenoid with permanent magnet bi-directional assist comprising the steps of:

wrapping a single electro-conductive wire around a bobbin;

securing a plunger within a bore of the bobbin;

disposing a spacer and a permanent magnet at one end of the plunger;

biasing the plunger in a first position against the spacer; and

placing an end plate having an attracting stud at an end of the bobbin opposite to that of the permanent magnet.

19. (Withdrawn) The method of claim 18 further comprising the step of securing a return spring to be operationally connected to the plunger such that the return spring biases the plunger against the spacer when current is not induced in the wire.

20. (Withdrawn) The method of claim 18 further comprising the step of configuring the plunger to have a polarity similar to that of the permanent magnet when current is not induced in the wire and to have a polarity opposing that of the permanent magnet when current is induced in the wire.

21. (Withdrawn) The method of claim 18 further comprising the step of placing a set of shunt components radially around the plunger between the permanent magnet and the wire.

22. (Currently Amended) A single coil solenoid comprising:

a first magnetic circuit between a movable plunger and a permanent magnet spaced from the movable plunger by a non-magnetic spacer at a first electromagnetic condition created when a single coil of wire is not energized~~, the non-magnetic spacer disposed in a path in which the movable plunger is configured to move~~; and

a second magnetic circuit between the plunger and ~~an~~ a stationary attracting member at a second electromagnetic condition created when the single coil of wire is energized, wherein the plunger is linearly spaced from the stationary attracting member by the first magnetic circuit and driven linearly towards the attracting member by the second magnetic circuit.

23. (Currently Amended) A solenoid kit comprising:

a bobbin configured to receive a single coil of wire wrapped therearound;

a permanent magnet having a first fixed polarity ~~and configured to be positioned in a direction of linear movement~~;

an attracting stud having a second fixed polarity opposite that of the first fixed polarity of the permanent magnet;

an armature configured to move linearly through a bore of the single coil bobbin ~~in the direction of linear movement~~between the permanent magnet and the attracting stud; and

a non-magnetic spacer to be disposed between the permanent magnet and the armature ~~in the direction of linear movement~~and configured to reduce attraction between the armature and the permanent magnet.

24. (Currently Amended) The kit of claim 23 further comprising a housing and an end plate connected to the housing, the end plate including ~~an~~ the attracting stud ~~having a polarity opposite to that of the permanent magnet~~.

25. (Original) The kit of claim 23 wherein the armature is configured to have an attraction to the permanent magnet when no current is induced in the single coil.

26. (Original) The kit of claim 23 further comprising a return spring connectable to the armature.

27. (Previously Presented) The kit of claim 23 wherein the non-magnetic spacer has a first end and a second end opposite the first end, and wherein the first end is configured to abut the permanent magnet and the second end is configured to abut the armature when no current is induced in the single coil of wire.

28. (New) A solenoid comprising:

a magnetically conductive shell having a single coil of wound wire;

a movable magnetic object disposed within a bore of the single coil, the object configured to receive a magnetic force when current is induced in the single coil;

a permanent magnet having a fixed polarity that magnetically repels the moveable magnetic object when current is induced in the single coil and magnetically attracts an end of the movable magnetic object when no current is induced in the single coil;

a non-magnetic spacer disposed between the permanent magnet and the movable magnetic object;

a return spring operationally connected to bias the movable magnetic object in a return position against the spacer when no current is induced in the single coil;

an end plate connected to an end opposite to that of the return spring and an attracting stud connected to the end plate, the attracting stud having a polarity opposite to that of the movable magnetic object when current is induced with a specific electrical polarity in the single coil;

a housing having the single coil, the plunger, the spacer, and a bobbin disposed therein, wherein the single coil is wrapped around the bobbin; and

a number of shunt components connected to the bobbin, wherein the number of shunt components is configured such that as a distance of the shunt components from the permanent magnet increases a hold force between the plunger and permanent magnet decreases.

29. (New) A solenoid comprising:

a magnetically conductive shell having a single coil of wound wire;

a movable magnetic object disposed within a bore of the single coil, the object configured to receive a magnetic force when current is induced in the single coil;

a permanent magnet having a fixed polarity that magnetically repels the moveable magnetic object when current is induced in the single coil and magnetically attracts an end of the movable magnetic object when no current is induced in the single coil;

a non-magnetic spacer disposed between the permanent magnet and the movable magnetic object;

a return spring operationally connected to bias the movable magnetic object in a return position against the spacer when no current is induced in the single coil;

an end plate connected to an end opposite to that of the return spring and an attracting stud connected to the end plate, the attracting stud having a polarity opposite to that of the movable magnetic object when current is induced with a specific electrical polarity in the single coil;

a housing having the single coil, the plunger, the spacer, and a bobbin disposed therein, wherein the single coil is wrapped around the bobbin;

a number of shunt components connected to the bobbin; and

an air gap between the number of shunt components and the housing.